REMARKS

The abstract and specification have been amended in order to correct grammatical and idiomatic errors contained therein. No new matter has been added.

In order to more particularly point out and distinctly claim the subject matter which Applicants regard as the invention and respond to the rejection of Claims 5-7 under 35 USC 112, Claims 5 and 6 has been canceled and replaced by newly presented Claims 9 and 10. The dependency of Claim 7 has been amended from Claim 5 to Claim 9. No new matter has been added. It is respectfully submitted that the currently presented claims are cured of all formal defects and that the rejection under 35 USC 112 and the objection to Claims 5 and 6 have been overcome.

Claims 5 and 6 have been rejected under 35 USC 102(b) as being anticipated by Shimamune et al. Claims 5 and 6 also have been rejected under 35 USC 102(b) as being anticipated by Yamanaka et al. Claim 7 has been rejected under 35 USC 103(a) as being unpatentable over Yamanaka et al in view of Uchida et al. Applicants respectfully traverse these grounds of rejection and urge reconsideration in light of the following comments.

The presently claimed invention is directed to an electrolytic gas generation device for generating ozone gas which comprises an anode chamber in which the ozone gas and oxygen is generated, a cathode chamber in which hydrogen gas is generated, a solid electrolyte ion exchange film separating the anode chamber from the cathode chamber, a porous anode provided at a first side of the ion exchange film in the anode chamber, a porous cathode provided at an opposite side of the ion exchange film in the cathode chamber, a power source for imposing a potential difference between the porous anode and the porous cathode, means for supplying pure water to a mixing means, means for supplying carbon dioxide to the mixing means, and mixing means for mixing the pure water and the carbon

dioxide to form carbonated water and supply the carbonated water to the anode chamber.

As discussed in the present specification, the present invention is based on the discovery that when pure water is mixed with carbon dioxide and used as an anolyte in an electrolytic gas generation device for generating ozone gas, high concentration ozone can be provided continuously and stably over a long period of time. As discussed in the present specification, in conventional processes in which ultrapure water is used and not mixed with carbon dioxide, the generation efficiency of the ozone gas is only about 10% which is about 1/3 of that obtained by the present invention. The prior art cited by the Examiner does not suggest that the ozone generation rate can be increased by mixing pure water with carbon dioxide to form carbonated water used as an anolyte. Therefore, it is respectfully submitted that the presently claimed invention clearly is patentably distinguishable over the prior art cited by the Examiner.

The Shimamune et al reference discloses an electrode structure for ozone production which comprises a perfluorocarbon sulfonic acid-based ion-exchange membrane as a solid electrolyte and an anode placed on one side of the solid electrolyte and having a lead oxide as an electrode catalyst, wherein a porous, perfluorocarbon sulfonic acid-based ion-exchange resin layer is provided between the electrolyte and the anode. Although this reference discloses that ion-exchanged water can be electrolyzed to produce ozone using the electrode structure disclosed there, Applicants can find no disclosure with respect to mixing pure water and carbon dioxide to form carbonated water and using the carbonated water as an anolyte in the ozone generation process. Therefore, this reference does not even present a showing of prima facie obviousness under 35 USC 103(a) with respect to the presently claimed invention.

The Yamanaka et al reference discloses equipment and a process for producing high-purity water. This reference

discloses that an ozone generator can be part of the equipment and that deionized water or high-purity water can be used as a feed water to the electrolytic unit for generating ozone. This reference further discloses that an electrolyte can be added to the feed water to either the anode or to the cathode chamber and that any substance can be chosen from among various acids, bases or salts as an electrolyte. This reference further discloses that an inorganic acid, such as hydrochloric acid, sulfuric acid, carbonic acid or nitric acid and an organic acid such as acetic acid, citric acid or oxalic acid or a base such as ammonia, amines or other organic bases can be used as the electrolyte. There is no specific example in this reference of adding carbonic acid to high purity water to form carbonated water to be used as an anolyte in the ozone generator. In fact, column 13, lines 29-33, show the addition of dilute hydrochloric acid to deionized water to be used as an anolyte in the ozone generator. Therefore, this reference clearly does not anticipate the presently claimed invention under 35 USC 102(b) and, at best, only presents a showing of prima facie obviousness under 35 USC 103(a) which can be rebutted.

The Uchida et al reference discloses a method for preparing a carbonate spring by supplying carbon dioxide to a carbon dioxide dissolver and dissolving the carbon dioxide in raw water. The carbon dioxide dissolver has a hollow fiber membrane incorporated therein and dissolves carbon dioxide in warm water by making the water flow through the inner cavities of the hollow fibers and thereby bring it into contact with carbon dioxide. However, the present invention requires that pure water be supplied to one side of the carbon dioxide contact mechanism and that carbon dioxide be supplied to the other side thereof via a film. The carbon dioxide dissolver of Uchida et al does not fit this structure. Moreover, there is no suggestion in this reference which would motivate one of ordinary skill in the art to use carbonated water as feed anolyte in an ozone generating device. Therefore, this

reference does not cure the deficiencies of the primary references.

Although the Examiner at best has only made a showing of prima facie obviousness under 35 USC 103(a), objective evidence is of record in the present application which is more than sufficient to rebut any proper rejection under 35 USC 103(a). In the present specification, Examples 1-3 illustrate ozone generation according to the present invention while Comparative Examples 1 and 2 perform ozone generation according to the present invention except that carbon dioxide is not mixed with the pure water supplied to the anode chamber. As can be seen by the results disclosed in the present specification, the ozone generation of Example 1 was 8.4 g/hr while the ozone generation in Comparative Example 1 was 2.7 g/hr. This is more than a 300% decrease in production between Example 1 and Comparative Example 1. In Example 2, the quantity of ozone gas generated was 8.4 g/hr while in Comparative Example 2, the quantity of ozone gas generated was about 4.5 g/hr, which is about a 200% decrease. Nothing in the prior art suggests that such a result would be obtained by feeding carbonated water to the anode chamber. As such, the presently claimed invention clearly is patentably distinguishable over the prior art cited by the Examiner.

The Examiner is respectfully requested to reconsider the present application and to pass it to issue.

Respectfully submitted,

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